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STATUS OF RESEARCH AND CONTROL ON BALSAM WOOLLY APHID

(Outline of a talk to be given to the PNW Forest and Range Advisory Committee Meeting at Bend, Oregon September 26-27, 1957).

INTRODUCTION

1. Outbreak discovered in 1954 (European pest).
2. Now covers more than 350,000 acres - 1957 survey findings not completely summarized.
3. Three species of our native fir involved. Mostly matured sawtimber trees being killed.
4. Since no control is known, the situation is regarded with great concern by the forest industry, recreationists, etc.
5. Formation of Chermes Committee

CURRENT OUTBREAK

(Illustrated by 1956 survey map)

1. Areas and main species involved (Refer to map)
   - A. Pacific silver fir - Abies amabilis
   - B. Alpine fir - A. lasiocarpa
   - C. Grand fir - A. grandis
   - D. Noble fir and exotics in the Wind River Arboretum attacked
   - E. Area increase has been from 276,000 acres in 1954 to 356,000 acres in 1956, and continued increase in 1957.
   - F. Current survey being made to determine volume affected.

2. Economic importance

   A. Pacific silver fir is the third most important tree in Washington state as to volume; is the principal pulp-producing species in some areas; 50 to 70 percent of the trees killed in some areas.

   B. Subalpine fir is generally not commercial size but highly valuable as watershed cover.

   C. Grand fir of considerable value in localized areas.

3. Effects on Forest Management

   A. Created many problems for forest managers

   B. Salvage of killed timber complex because affected stands are intermingled with nonsusceptible tree species.

   C. Orderly management plans being disrupted by salvage cutting; sustained yield cutting budgets greatly exceeded.

   D. Fire hazard in widespread salvage slash a serious problem.

   E. Managers wondering what species to encourage in the next crop.

THE INSECT AND ITS DAMAGE

(Illustrate with slides)

1. History in the Northwest
2. Appearance (Refer to slides, photos, samples)
3. Damage (Refer to slides, photos, samples)

PRESENT RESEARCH

1. General

   A. Program is of recent origin; lack of personnel (Mitchell hired in 1957)

B. Cooperative aspects between the Station, Weyerhaeuser Timber Company and Oregon State College.

C. Limited nature of studies due to shortage of funds, personnel and equipment.

2. Station Research Program

A. Biological studies of chermes

(1) The biology and habits of the insect as found on different host species at various elevations in Oregon and Washington (number of generations per season, stages present at different times of the year, reproductive rate and potential, etc.). Collections made weekly at permanent sample points.

B. Studies of Natural Control Factors

(1) Identity and effectiveness of native predators. Several native insects, mostly small flies, have been observed feeding on chermes populations; these are being reared and identified. So far none have been found that are highly effective; however, European and Canadian entomologists may be interested in securing colonies of them for release.

(2) Introduction of foreign predators. A small predaceous fly (Aphidoletes thompsoni Mohn) was introduced from Czechoslovakia in July and colonized in 3 different areas in Oregon and Washington. A total of some 1800 of the insects were reared from the larval and pupal form and released. So far, at least some of the insects mated and produced brood which is feeding on chermes. Since handling and colonizing of insects is an extremely delicate operation even with highly developed equipment, we feel lucky to have achieved at least some degree of success using our very crude and improvised equipment and techniques. Until the predators

have successfully passed through a winter, we will not be sure of establishment in our climate. Even if they become established we will not know how effective they will be as enemies of chermes for perhaps several years. The predator introduction project took up a large share of the 1957 season's research time.

C. Studies of trends of tree mortality caused by chermes. In 1954 and 1956 a series of tagged tree plots were set up to determine how fast trees die that are infested by the balsam woolly aphid, what types of trees are killed, and what are the indicators of imminent death. This is a cooperative study with Weyerhaeuser Timber Company. To date from 2 to more than 30 percent of the plot trees have been killed; mortality has been highest in the dominant and co-dominant crown classes, and in trees near exposed stand edges.

D. Investigations in the use of aerial photographs for detecting and appraising mortality. Since 1955 cooperative studies have been carried on by the Station, Weyerhaeuser Timber Company and the Lands Division of Northern Pacific Railroad to develop the needed techniques. The studies are being conducted in the Mt. St. Helens area of Washington. Various scales of black and white, color and a special armed forces film have been tested. It has been found that by interpretation of large scale photographs, chermes-killed and damaged trees can be located and counted with good accuracy. Valid estimates of volume can also be made by using the photo method, plus a small amount of ground sampling. Using these techniques, a special cooperative survey has just been completed of some 410,000 acres in the Mt. St. Helens area of Washington. Those participating in the cooperative survey were Weyerhaeuser Timber

Company, Northern Pacific Railroad, Harbor Plywood Corporation, the Washington State Department of Natural Resources and the U. S. Forest Service.

NEEDED RESEARCH

The Chermes problem has created many urgent problems for the forest manager. He is looking to research to supply the answers. The work to date has been largely exploratory and intensive detailed investigations should be gotten underway as soon as possible. Following are some of the most urgently pressing questions needing answers:

1. What are the habits and life histories of chermes affecting various host trees in Oregon and Washington? This work is basic to any research on the problem. Studies are underway but need to be greatly intensified.
2. What control measures can be developed? Biological control, particularly use of insect enemies appears to offer considerable promise and is being widely studied and used in Canada and Europe. We feel we have made a good start in this direction and hope to place much effort in this direction in the next few years. However, we are badly handicapped in having neither the essential highly-trained personnel nor the laboratory facilities to do the job. We are partly solving this problem by cooperating with the Entomology Department at Oregon State College in a 2-year project to develop a biological control program of the balsam woolly aphid. A man, R. G. Mitchell, who has been working seasonally with us will head the program at the college during the school year and at the same time will work toward his Ph. D degree in this highly specialized field. As yet,

we have no prospects of financing the development of the needed laboratory facilities.

In addition to biological control, studies should also be made of the possibilities of chemical control, particularly through use of systemic insecticides which are being increasingly used to control insect pests of agricultural crops.

3. What are the possibilities of applying forest management or silvicultural techniques to prevent or minimize damage by the insect? Field observations indicate the insect prefers some species of white fir to others; it also appears to prefer some types and ages of trees and stands to others. This suggests that genetic studies to develop resistant trees through selection, breeding and propagation should be initiated.

4. How long do attacked trees live and how long do killed trees remain merchantable? With the tremendous amount of dead and dying timber now present, this is a vitally important question to forest land managers. Some information on this problem is now being gathered; it could well be a full-time study.

5. What survey techniques can be developed for evaluating tree mortality as to location, amount, time of death and merchantability? We have probably made more progress toward answering this question than any of the others; however, much refinement of present techniques and development of newer and cheaper ones is believed possible.

These we believe represent the most important research problems concerning the balsam woolly aphid that need early solutions. There are many more of a less important nature. With the present epidemic continuing at a high level, it is important that studies be initiated as soon as possible. Significant progress hinges on two main items--trained personnel and adequate laboratory facilities.